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(54) Abstract Title
Gear-driven locks

(57) A lock for a window or door comprises a two-part housing 21, 22 and a gear mechanism 32 within the housing 21, 22, arranged to be operated by a handle. An espagnolette locking mechanism has a sliding bar 10 which is driven by the gear mechanism 32. An additional locking member in the form of a hook 30 is operable by the handle so as to be moveable between an unlocked position and a locking position. The housing 21, 22 is of a plastics material and defines a bearing in which the espagnolette bar 10 slides. The housing 21,22 may also be formed with means for holding a fastening nut. The espagnolette bar 10 may be formed with a slot for the passage of the hook 30. The housing of the lock may pass through both inner and outer members of a respective window or door profile.

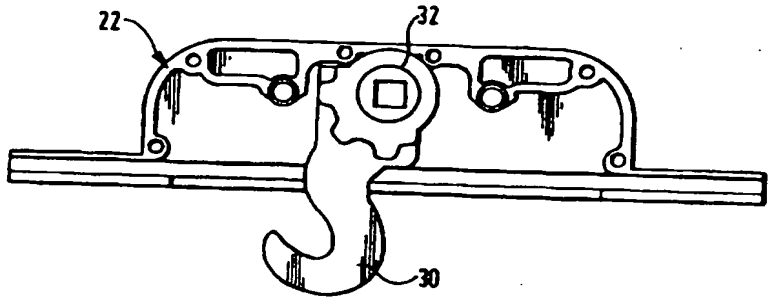

Fig.3

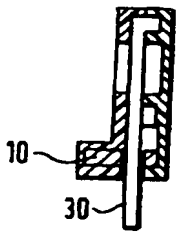

Fig.4.

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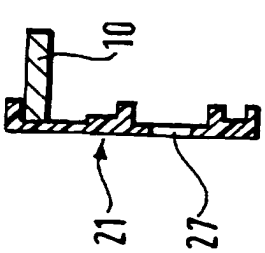

Fig.1(B)

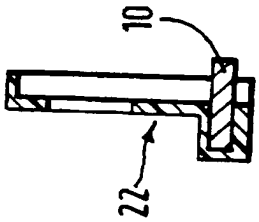

Fig.2(B).

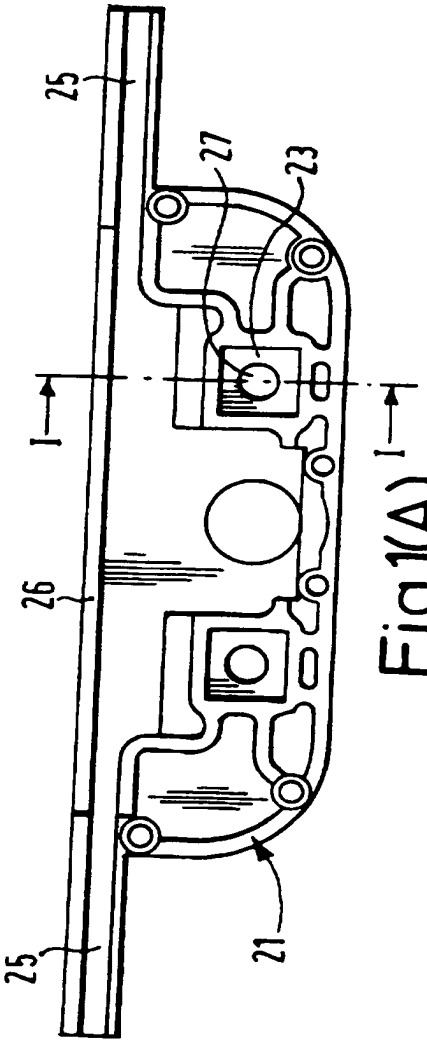

Fig.1(A).

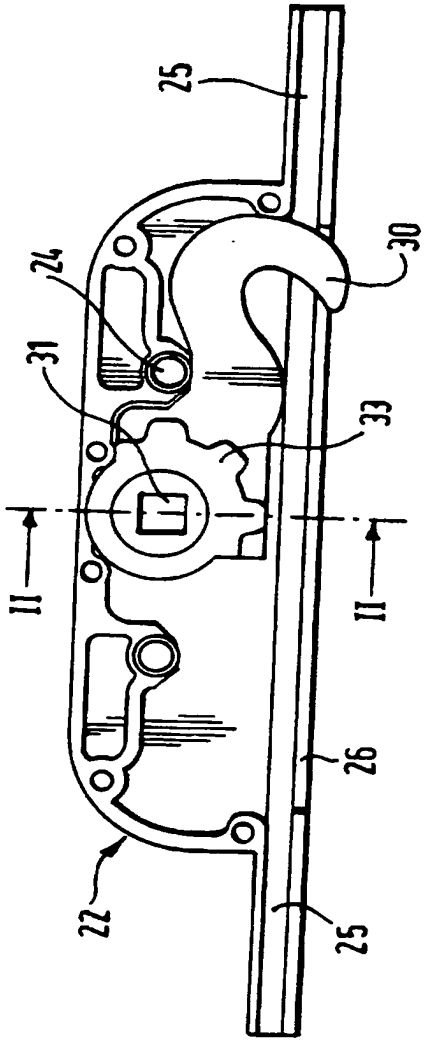

Fig.2(A).

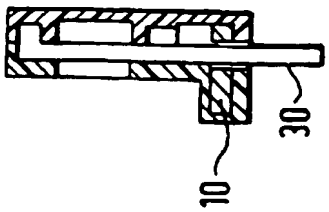

Fig.4.

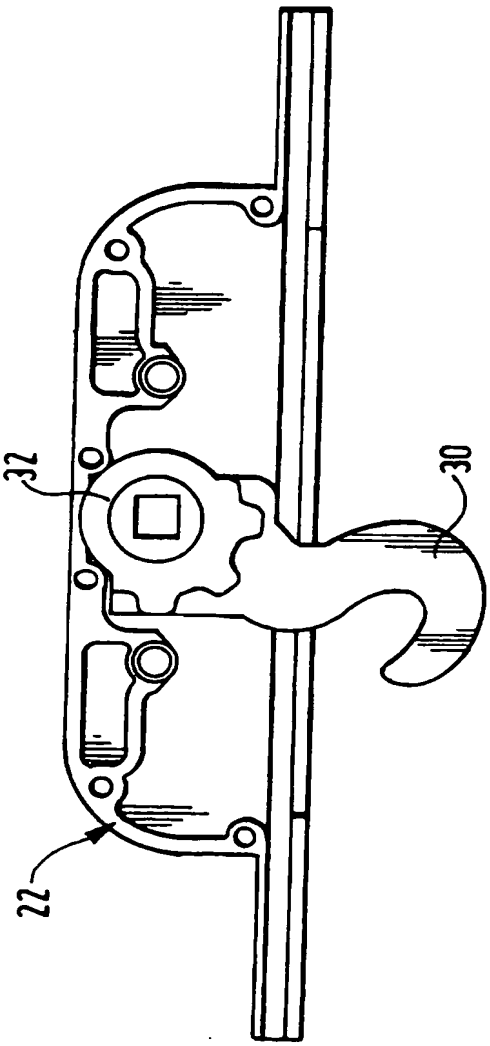

Fig.3

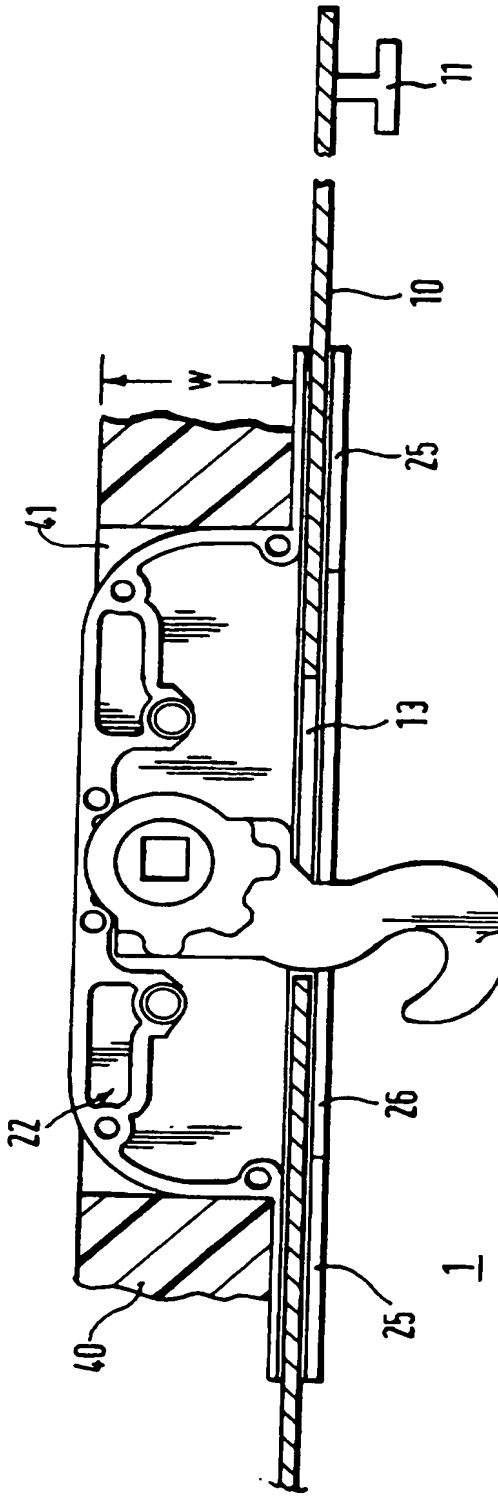

Fig.5.

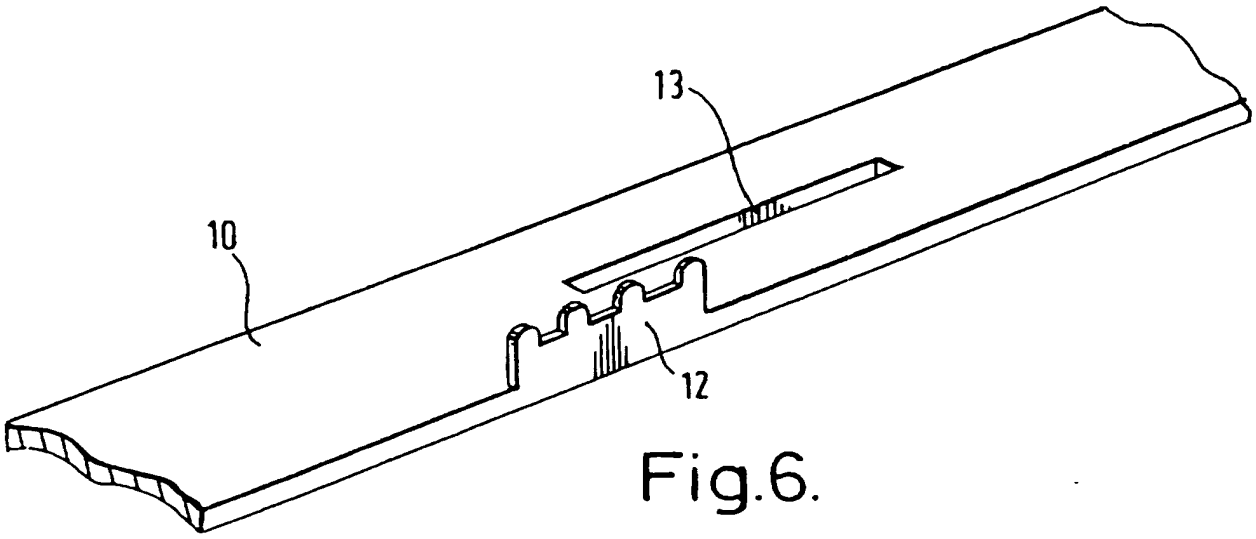

Fig.6.

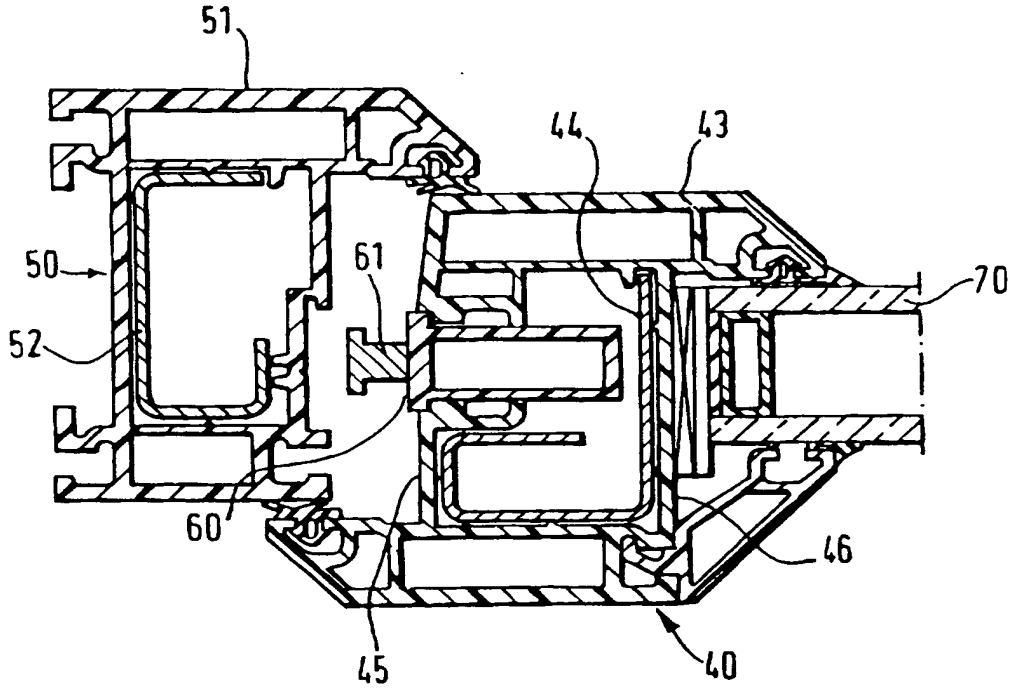

Fig.7.

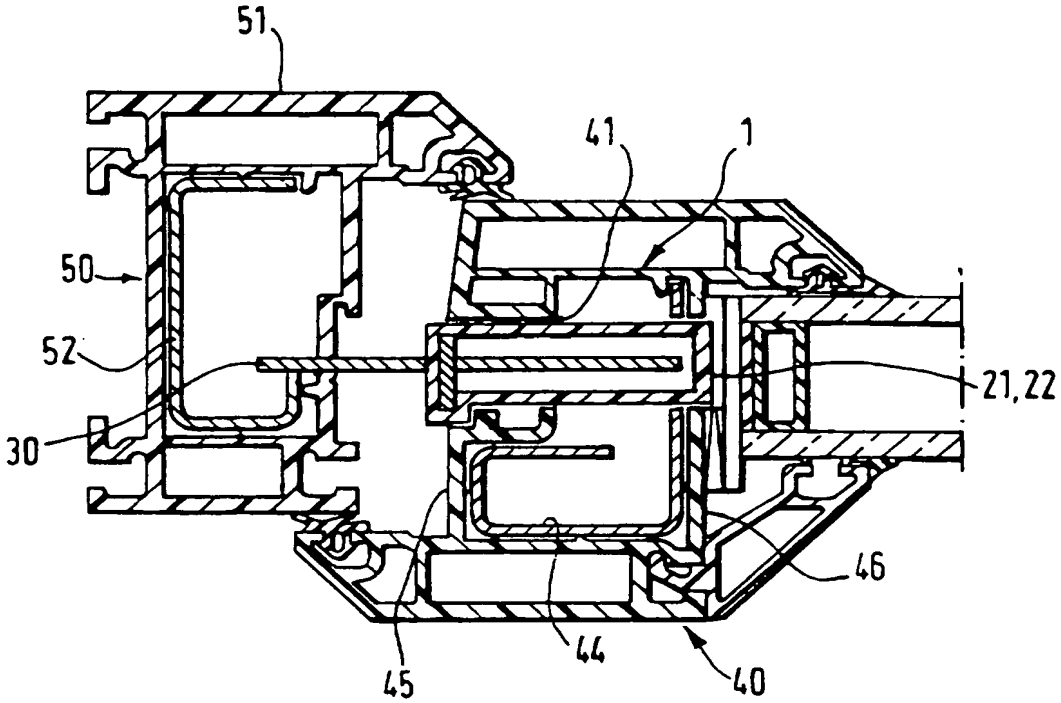

Fig.8.

LOCKS

This invention relates to locks and is concerned particularly with locks for doors and windows.

At the present time, much attention is paid to the security of doors and windows. Many modern windows and doors are made of uPVC. Although an attractive material from the point of view of appearance, installation and maintenance, uPVC can be relatively weak from the point of view of security - to a certain extent, this is due to its inherent flexibility. Therefore, good and effective locking systems are necessary.

Many uPVC windows and doors are fitted with espagnolette type locks. As is well-known in the trade, an espagnolette type lock typically comprises a sliding bar or rod on which a pair of headed studs are fitted. The studs engage with keeps on the window or door frame, and are brought into and out of engagement with the keeps by sliding of the bar. Any other number of studs may be provided. Locking members of shapes and configurations other than studs can be provided.

Another, similar type of lock is the so-called "shootbolt". This comprises a pair of bars or rods which are oppositely acting, and in order to lock, are caused to move in opposite directions such that ends of the bars or rods (or locking members carried thereon) engage with keeps in the outer window or door frame. In the interests of simplicity, the term "espagnolette" is used in this specification to include both espagnolette and shootbolt types of locks, all having the common feature of one or more slideable bar or rod to effect locking.

Although espagnolette locks have been found to be effective for a large number of years, they can be less than perfect when used with uPVC windows or doors, due to the flexibility of the uPVC material, which affords would-be intruders the opportunity to overcome the lock. Therefore, it has become popular to fit a further lock in addition to the espagnolette. Such a lock typically comprises a hook or other locking member which is centrally acting at the location of the handle which operates the espagnolette. Thus, the hook or other locking member is effective at a position intermediate the locking members of the espagnolette.

Preferred embodiments of the present invention aim to provide locks which incorporate both an espagnolette and a further, central locking mechanism, and are generally improved in terms of construction, ease of fitting, operation and reliability.

According to one aspect of the present invention, there is provided a lock for a window or door, the lock comprising:

a. a housing;

b. a gear mechanism within the housing, arranged to be operated by a handle;

c. an espagnolette locking mechanism having a sliding bar which is driven by said gear mechanism; and

d. an additional locking member which is operable by said handle so as to be moveable between an unlocked position in which it is at least partially retracted within said housing, and a locking position in which it engages a respective keep in or on an outer frame of the window or door:

wherein said housing is of a plastics material and defines a bearing in which said bar slides.

Preferably, said plastics material is a self-lubricating plastics material.

Preferably, said housing has a main portion within which said gear mechanism and locking member are housed, and at least one side portion which extends from said main portion axially of said bar, to provide at least part of said bearing.

According to another aspect of the present invention, there is provided a lock comprising a housing and a locking mechanism within said housing, wherein said housing comprises two parts which are secured together by at least one nut and bolt, one of the housing parts having holding means to hold the nut captive with a degree of play, to allow movement of the nut in a direction radially of the axis of the threaded bore of the nut.

Preferably, said holding means comprises a recess of substantially the same shape as the nut, but slightly larger than the nut.

Preferably, said nut is of a substantially square shape.

Preferably, said bolt threadedly engages an aperture formed in one of said housing parts and the bolt is of a material harder than that of that housing part, such that said aperture is formed with a screwthread cut by the thread of the bolt.

Preferably, one of said housing parts has said holding means and the other of said housing parts is formed with said aperture.

Preferably, said housing is of a plastics material.

According to a further aspect of the present invention, there is provided a lock for a window or door, the lock comprising:

a. a housing;

b. a gear mechanism within the housing, arranged to be operated by a handle;

c. an espagnolette locking mechanism having a sliding bar which is driven by said gear mechanism; and

d. an additional locking member which is operable by said handle so as to be moveable between an unlocked position in which it is at least partially retracted within said housing, and a locking position in which it engages a respective keep in or on an outer frame of the window or door:

wherein said bar is formed with a slot through which said locking member passes as it moves between said unlocked and locking positions, the slot being formed in a portion of the bar intermediate its two longitudinal edges.

Preferably, said slot extends axially of and is formed substantially centrally of said bar.

Preferably, said bar is provided along one longitudinal side thereof with a rack which is part of or engages with said gear mechanism and co-extends at least partially with said slot.

The invention extends to a window or door provided with a lock according to any of the preceding aspects of the invention. Preferably, such a window or door is substantially of uPVC.

According to another aspect of the present invention, there is provided a window or door having a hollow profile which defines a side of the window or door and a lock which is mounted in said profile, wherein said profile comprises an outer member which defines an outer face of the profile and a side face of the window or door, an inner member which defines an inner face of the profile, and transverse members which join said inner and outer members, and said lock has a housing which extends through respective apertures formed in both said outer and inner members.

Preferably, said profile is an extruded uPVC profile.

Preferably, said lock comprises an espagnolette locking mechanism.

Preferably, said lock comprises an additional locking member disposed intermediate locking elements of said espagnolette locking mechanism.

The above various aspects of the invention may be combined in any combination.

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1A is a side elevation of a first part of a lock housing;

Figure 1B is a section of the first housing part, taken on the line I-I of Figure 1A, showing an espagnolette bar in position;

Figure 2A is a side elevation of a second part of the lock housing, showing a hook in a retracted position in the housing;

Figure 2B is a section of the second housing part, taken on the line II-II of Figure 2A, showing the espagnolette bar in position;

Figure 3A is a view similar to that of Figure 2A, but showing the hook in a locking position;

Figure 4 is a cross-sectional view of the assembled first and second housing parts, showing the espagnolette bar and part of the hook in its locking position;

Figure 5 is a view similar to that of Figure 4, but showing the lock housing installed in a window profile, and showing the espagnolette bar in the housing;

Figure 6 is a partial perspective view of the espagnolette bar of Figure 5;

Figure 7 is a cross-sectional view of a window in a frame, with a conventional espagnolette locking mechanism; and

Figure 8 is a view similar to Figure 7, but showing a lock as in Figures 1 to 6.

In the figures, like reference numerals denote like or corresponding parts.

The window lock 1 that is shown in Figures 1 to 6 comprises both espagnolette and central hook locking mechanisms. To this end, an espagnolette bar 10 is slideably mounted in a plastics housing, which comprises both a first part 21 and a second part 22. The espagnolette 10 bar carries a pair of headed studs 11 which are arranged to engage in respective keeps (not shown) in the outer window frame. As shown in Figure 6, the espagnolette bar 10 is also provided with a rack 12 and with a central slot 13.

A hook 30 is mounted in the plastics housing, and is formed with a square aperture 31, to receive the spindle of a handle (not shown) to operate the lock. A pinion gear 32 is formed integrally with the hook 30, or mounted thereon for rotation therewith. Teeth 33 of the pinion 32 are arranged to engage teeth of the rack 12 such that, as the operating handle is rotated, the hook 30 rotates with it as does the pinion 32, and the interengaging teeth of the pinion 32 and the rack 12 cause the rotary movement of the handle to be translated into linear movement of the espagnolette bar 10, in a manner which is generally well known. As the operating handle is rotated, the hook 30 is moved between a retracted or unlocked position as shown in Figure 2A, and an extended or locking position, as shown in Figures 3, 4 and 5.

When in its locking position, the hook 30 engages a respective keep in the outer window frame, to provide secure locking. Preferably, the keep is in the form of a plate provided with two apertures, the hook 30 passing through a first one of the apertures as it moves into its locking position, and the tip of the hook projecting into the second aperture as the hook 30 reaches its full locking position. In this way, the hook is firmly engaged in the keep such that, any attempts to prise the hook 30 away from the keep only serve to engage the hook more firmly with the keep. Such a hook and keep are disclosed in, for example, my earlier Patent GB 2 270 537.

The housing parts 21 and 22 are preferably moulded from a plastics material - for example, nylon. Preferably, the plastics material has self-lubricating properties, to provide an effective and smooth bearing for the espagnolette bar 10.

The first housing part 21, as shown in Figure 1A, is formed with two square sockets 23, each to receive a respective nut of substantially square cross-section, and each formed with an aperture 27 to receive a respective fixing bolt. The second housing part 22, as shown in Figure 2A, is formed with two respective apertures 24, each to receive a respective fixing bolt to engage a respective nut in a respective one of the square sockets 23, in order to secure the two housing parts 21 and 22 together.

Each of the sockets 23 is made slightly larger than the respective nut, so that the nut has a limited amount of movement possible within the socket 23. This can allow for a modest amount of tolerance in the fabrication of the square nut. The diameter of each aperture 24 in the second housing part 22 is preferably slightly less than that of the securing

bolt that passes through it. Therefore, as the securing bolt is screwed into the respective aperture 24, it will tend to cut a thread in the aperture 24. The bolt then engages the tapped hole in the respective nut 23 and, because of the small amount of play allowed for due to the slight oversize of the sockets 23, the nut 23 can move slightly in order to become accurately centred with the bolt passing through the respective aperture 24. In this way, a self-centering effect is achieved. Since the fixing bolt, of relatively hard metal, cuts into the relatively soft plastics material of the second housing part 22, a lock nut effect is achieved, since the fixing bolt threadedly engages not only the nut 23, but also the thread that it cuts in the respective aperture 24.

Both of these self-centering and locking nut features are very advantageous, in facilitating ready assembly of the housing parts and other components of the lock 1. The diameter of each aperture 27 may be slightly greater than that of the respective fixing bolt, or may be slightly smaller than that of the respective fixing bolt, to provide a lock nut effect as an alternative or in addition to the apertures 24.

Each of the housing parts 21 and 22 is formed with a respective extension 25, which extends along a respective part of the espagnolette bar 10, to provide an extended bearing surface therefor. Each of the extensions 25 extends axially of the espagnolette bar 10, from the main part of the lock housing. Each of the housing parts 21 and 22 is also formed with a respective part of a slot 26 through which the hook 30 may pass as it travels between its unlocked and locking positions.

As may be seen in Figure 6, the slot 13 which is formed in the espagnolette bar 10, in order that the hook 30 may pass through it, is formed substantially centrally of the espagnolette bar 10. This greatly assists strength of the overall assembly. When in its locking position, the hook 30 is firmly supported either side by the respective side portion of the espagnolette bar 10. The rack 12 may be formed integrally with the espagnolette bar 10, or provided as an additional part, either secured firmly to the espagnolette bar 10 (eg by spot welding prior to a galvanisation step) or simply engaging with a respective part (eg a recess) in the espagnolette bar 10, so that it moves therewith.

As seen in Figure 2A, when in its unlocked, retracted position, the hook 30 extends very slightly below the bottom (as seen) level of the housing 21, 22. In an alternative arrangement, the shape and configuration of the hook 30 and housing parts 21, 22 are such that the hook 30 retracts fully within the housing 21, 22 when in its unlocked position. It is preferred, however, that when fully retracted, the end of the hook 30 engages at least partly in the slot 13 formed in the espagnolette bar 10. This ensures that the hook 30 does not disengage from the espagnolette bar 10, even when fully retracted, thereby avoiding any jamming of the mechanism.

As shown in Figure 5, the lock housing may be secured to a profile 40 of a window. To this end, the profile 40 is formed with a suitable recess 41 to accommodate the housing, preferably as a close fit. It may be seen that the housing of the lock 1 extends the full width w of the profile 40. In practice, especially where the profile is of uPVC material, it may have a shape in cross-section which contains numerous ribs and recesses. By providing the housing over the full width w of the profile 40, substantial

strength can be added to the profile 40. As may be seen in Figure 5, the lock housing is just a little bigger than the width w of the profile 40. It may be made slightly smaller than the profile width w.

Figure 7 shows in more detail an example of a typical uPVC profile 40 of a window, which opens and closes in a profile 50 of an outer frame. The profile 50 comprises an outer extruded section 51 of uPVC, and an internal reinforcing section 52 of steel or aluminium. Similarly, the profile 40 comprises an outer extruded section 43 of uPVC and an internal reinforcing section 44. The profile 40 has an outer member 45 which defines an outer face of the profile 40 and a side face of the window, and an inner member 46 which defines an inner face of the profile 40. As may be seen in Figure 7, various transverse members join the inner and outer members 45 and 46. A double glazed window unit 70 is also shown.

A conventional espagnolette locking mechanism 60 is mounted in the profile 40, and carries typical headed locking studs or "mushroom" studs 61. As may be seen in Figure 7, the housing of the locking mechanism 60 extends through the outer member 45 of the profile 40 and, in this respect, is supported in a limited way.

Figure 8 shows the same general configurations of window profile 40 and outer frame profile 50. However, in this figure, a lock 1 of the type illustrated and described above with reference to Figures 1 to 6 is fitted into the profile 40.

In this case, the housing 21, 22 of the lock 1 extends through the recess 41 which is formed through the full width of the profile 40. Thus,

respective apertures are made both in the outer member 45 and the inner member 46 and, in this example, the housing 21, 22 extends also through the reinforcing section 44. In this way, the lock 1 is supported much more securely in the profile 40, and the overall strength of both the lock 1 and profile 40 are enhanced. In particular, twisting of the lock 1 in the profile 40 is inhibited.

The housing 21,22 may be of adjustable size (eg telescopic), to accommodate profiles 40 of different widths.

In the profile 50 of the outer frame, it may be seen that the hook 30 engages the reinforcing section 52 which, together with the uPVC section 51, is formed with a respective slot to receive the hook 30. Preferably, a keeper plate is fitted to the outer face of the profile 50, for the hook 30 to engage as described above, and shown in more detail in my above-mentioned patent specification GB 2 270 537. If desired, the reinforcing section 52 may be provided with two apertures with which the hook 30 engages, as an addition or alternative to the external keeper plate.

Although the use of a hook 30 is preferred, particularly with the respective keep described above, alternative locking members may be employed. Also, as made clear above, although the embodiment illustrated in Figures 1 to 6 uses a standard espagnolette mechanism, an alternative espagnolette or shootbolt mechanism may be employed.

The illustrated lock embodiment of the invention may be fabricated and assembled very readily, providing for an effective and reliable locking mechanism utilising combined espagnolette (or shootbolt) mechanism,

together with a central hook-type lock. Previously, locks have tended to be of substantially all-metal construction. The use of a tough plastics material for the housing parts 21, 22 not only facilitates ready production, but provides an excellent bearing for the espagnolette bar 10, thus providing smooth and reliable operation of the lock. With the housing 21,22 extending the full width of the profile 40, greater overall strength is achieved.

In this specification, the verb "comprise" has its normal dictionary meaning, to denote non-exclusive inclusion. That is, use of the word "comprise" (or any of its derivatives) to include one feature or more, does not exclude the possibility of also including further features.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly

stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A lock for a window or door, the lock comprising:

a. a housing;

b. a gear mechanism within the housing, arranged to be operated by a handle;

c. an espagnolette locking mechanism having a sliding bar which is driven by said gear mechanism; and

d. an additional locking member which is operable by said handle so as to be moveable between an unlocked position in which it is at least partially retracted within said housing, and a locking position in which it engages a respective keep in or on an outer frame of the window or door:

wherein said housing is of a plastics material and defines a bearing in which said bar slides.

2. A lock according to claim 1, wherein said plastics material is a self-lubricating plastics material.

3. A lock according to claim 1 or 2, wherein said housing has a main portion within which said gear mechanism and locking member are housed, and at least one side portion which extends from said main portion axially of said bar, to provide at least part of said bearing.

4. A lock comprising a housing and a locking mechanism within said housing, wherein said housing comprises two parts which are secured together by at least one nut and bolt, one of the housing parts having holding means to hold the nut captive with a degree of play, to allow

movement of the nut in a direction radially of the axis of the threaded bore of the nut.

5. A lock according to claim 4, wherein said holding means comprises a recess of substantially the same shape as the nut, but slightly larger than the nut.

6. A lock according to claim 4 or 5, wherein said nut is of a substantially square shape.

7. A lock according to claim 4, 5 or 6, wherein said bolt threadedly engages an aperture formed in one of said housing parts and the bolt is of a material harder than that of that housing part, such that said aperture is formed with a screwthread cut by the thread of the bolt.

8. A lock according to claim 7, wherein one of said housing parts has said holding means and the other of said housing parts is formed with said aperture.

9. A lock according to any of claims 4 to 8, wherein said housing is of a plastics material.

10. A lock according to any of claims 4 to 9, and also according to claim 1, 2 or 3.

11. A lock for a window or door, the lock comprising:

a. a housing;

b. a gear mechanism within the housing, arranged to be operated by a handle;

c. an espagnolette locking mechanism having a sliding bar which is driven by said gear mechanism; and

d. an additional locking member which is operable by said handle so as to be moveable between an unlocked position in which it is at least partially retracted within said housing, and a locking position in which it engages a respective keep in or on an outer frame of the window or door:

wherein said bar is formed with a slot through which said locking member passes as it moves between said unlocked and locking positions, the slot being formed in a portion of the bar intermediate its two longitudinal edges.

12. A lock according to claim 11, wherein said slot extends axially of and is formed substantially centrally of said bar.

13. A lock according to claim 11 or 12, wherein said bar is provided along one longitudinal side thereof with a rack which is part of or engages with said gear mechanism and co-extends at least partially with said slot.

14. A lock according to claim 11, 12 or 13, and also according to claim 10.

15. A lock for a window or door, substantially as hereinbefore described with reference to any of the accompanying drawings.

16. A window or door provided with a lock according to any of the preceding claims.

17. A window or door according to claim 16, of uPVC.

18. A window or door having a hollow profile which defines a side of the window or door and a lock which is mounted in said profile, wherein said profile comprises an outer member which defines an outer face of the profile and a side face of the window or door, an inner member which defines an inner face of the profile, and transverse members which join said inner and outer members, and said lock has a housing which extends through respective apertures formed in both said outer and inner members.

19. A window or door according to claim 18, wherein said profile is an extruded uPVC profile.

20. A window or door according to claim 18 or 19, wherein said lock comprises an espagnolette locking mechanism.

21. A window or door according to claim 20, wherein said lock comprises an additional locking member disposed intermediate locking elements of said espagnolette locking mechanism.

22. A window or door according to any of claims 18 to 21, wherein said lock is in accordance with any of claims 1 to 15.

23. A window or door, substantially as hereinbefore described with reference to any of the accompanying drawings.

INVESTOR IN PEOPLE

Application No: GB 9723655.8
Claims searched: 1-3

Examiner: Philip Silvie
Date of search: 16 March 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): E2A (AAK, AEC, AMXJ)

Int Cl (Ed.6): E05C (9/00, 9/02)

Other: Online: EDOC, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2 297 355 A (WMS) see figs. 1,2	1,2 at least
Y	GB2 247 714 A (IEC) see page 6, para. 2	1,2 at least
Y	EP 0 207 869 A1 (FERCO) see fig. 1	1,2 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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